System Sleuth Professional
User's Manual

Program Version: 4.0
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Introduction

System Sleuth professional consists of two separate programs:

1. **System Analyzer** Passive analysis program
2. **System Test** Hardware diagnostics

Each program runs best when certain operating conditions are met prior to operation. Please be sure to read the ***Getting Started*** sections at the beginning of each product user's manual for more information on running System Analyzer and System Test.

System Analyzer User's Manual

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About System Analyzer

System Analyzer is a toolbox of valuable PC diagnostic aids rolled into a single, easy to use software utility.

System Analyzer is a passive diagnostic utility. You can safely explore exacting details of your PC without the fear of accidental, unrecoverable modification to a particular subsystem.

The System Analyzer approach to diagnostics is a refreshing and enlightening change from the sterile and often times intimidating workings of other programs that deliver far less utility.

System Requirements

System Analyzer requires the following hardware and software in order to function properly:

Hardware: IBM PC, PC-XT, PC-AT, or 100% compatible computer 256K RAM installed 192K RAM free Monochrome/Hercules/CGA/EGA or VGA display adapter with appropriate display.

Software: MS or PC-DOS version 2.1 or higher.

Getting Started

Installation

The first step to installing System Analyzer is to make a working copy of the distribution diskettes. This task can be accomplished by using the DOS DISKCOPY command.

Startup Conditions

Start System Analyzer now and follow the Users Manual as you learn the use of this unique diagnostic utility.

System Analyzer is started by simply entering the SLEUTH command at the DOS prompt. If you wish to run System Analyzer from a working copy in the A: drive enter the following at the DOS A prompt:

A > SLEUTH

If you have placed the System Analyzer files in a subdirectory or on a different drive, it will be necessary to change to the current drive and directory in order to start System Analyzer.
For example:

C:\SLTHPRO > SLEUTH

General

The General menu provides information about the basic hardware and software configuration of the system being examined.

System Overview

System Overview provides an overview of your system and its subsystems such as CPU type, overall memory statistics, serial and parallel ports installed, etc.

General System Information

This window includes the basic system type; the kind of processor being used in the system; the presence of a math coprocessor; the number and type of peripheral ports and information about the BIOS ROM installed in the system.

ROM BIOS

The ROM BIOS ID byte of the system is compared to the codes used by IBM for classifying its systems. This classification determines the number and kind of functions provided by the BIOS.

BIOS Copyright

The copyright notice is retrieved from the BIOS and displayed for reference. This message will generally identify the maker of either the computer itself or the author of the BIOS code.

BIOS Date

The date of the BIOS programs along with the copyright notice will uniquely identify the BIOS in the system. Frequently when seeking support from software or hardware vendors it is helpful to know this information since it is the primary means of identifying particular versions of the BIOS. It is not uncommon for the same BIOS "version" to bear several revision dates.

CPU Type

The processor type is determined by testing and observing the behavior of the processor. Intel has documented the differences in certain registers after specific operations. These otherwise insignificant differences allow System Analyzer to determine exactly what processor is installed in the system.

Math Coprocessor

System Analyzer uses two methods to detect the presence of a math coprocessor, or Numeric Processor Extension (NPX). A configuration table in memory is examined and math coprocessor specific instructions are sent to the chip to determine its status. Some systems do not set a status bit in the configuration table, even though the CMOS setup may show a coprocessor installed. If this status bit is not set, System Analyzer will display an error message stating that the coprocessor is 'installed but not configured'. Another error message that System Analyzer can display is when a coprocessor chip does not respond. Most CMOS tables will automatically update if a coprocessor is detected and normally cannot be changed. If you can manually alter the CMOS math chip status, System Analyzer may display the message 'NPX configured but not installed'. This error will display if the chip has failed as well. Be sure that the System Analyzer Boot Status Information reflects correct hardware configuration.

DOS Version

This is the version number of the current operating system. Note that this does NOT indicate the version of DOS used during setup but only the most recently booted version of the operating system in memory.

Peripheral Ports

The number of Serial and Parallel ports is displayed. This information is NOT necessarily what the operating system thinks is present but what is present at the I/O ports used for each device.

Mouse Information

If your system is equipped with a mouse and the mouse device driver is active, information about the mouse will be displayed.

CMOS RAM Information

Information contained in the CMOS RAM of AT-Class systems is shown

Motherboard Switches

This reveals the settings of the motherboard DIP switch settings on PC and XT class systems. Note: this option will NOT be available on Systems which adhere to the AT standard Real Time Clock register usage conventions.

Disk

The options of this menu all relate to the fixed disk drives installed in the system. This information pertains to local drives C: or higher. The information is available at both a physical device level and the logical drive level.

Overview

Information about the physical characteristics of the fixed drives installed in the system. If there are two drives installed, information is provided for each drive. This information is the number of cylinders on each disk and the number of heads.

Partition Tables

Each physical hard disk drive attached to a system must have a partition table. This table is located on the first track of each hard disk. The table, which has a maximum of four entries, details how the drive is divided. Partitioning allows the physical hard disk to be divided into a number of logical disks.

Low Level Details

Each logical drive attached to a system has an area on its first track which contains key information about the format of the drive. This area is called the BIOS Parameter Block(BPB). The BPB introduces the operating system the layout of the disk. If there is more than one disk (logical) attached to the system, you will be prompted to press any key to see the BPB details for the next drive.

Number of FATs

(File Allocation Table) is the number of identical tables maintained on the disk. DOS customarily maintains two copies of the FAT so that it can repair the primary FAT in case of corruption.

Root entries

determines the maximum number of file or directory entries in the root directory. This value is generally 512. The root directory is the only directory with a limit to the number of entries.

Sectors per cluster

(sometimes referred to as Allocation Unit size) is the minimum disk allocation unit. This value is important because it defines the

smallest unit of disk space which the operating system can allocate to a file. A large number of sectors per cluster will result in large amounts of unused and yet unavailable disk space. DOS usually uses allocation units of either 4 or 8 sectors per cluster.

Number of heads

is the logical number of heads associated with this logical drive. Generally, this value is the same as the number of heads physically present.

Sectors per FAT

is the number of sectors which are allocated to each File Allocation Table. This value limits the number of clusters (or Allocation Units) which are controlled by a given logical disk. DOS uses this value to assist in location of data on the drive.

Hidden Sectors

is the number of sectors which are physically present on the disk BEFORE the beginning of the current partition. This value is used by DOS to confirm relative sector position when locating a given data sector on the disk.

View File

Selecting View File opens a dialog box and prompts you for a specific file name to examine. This option allows you to view any file on any disk on a sector by sector basis. Once you have defined a valid file name (including a path, if necessary), the display will show the contents of the first 256 bytes of the file.
Each byte within the display is shown as a two character hexadecimal value, with ASCII equivalents shown on the right.

Name: Enter a full path and filename. To select another drive, enter the drive letter:

C:, A:\, etc..

Files: This area shows the filenames available in for viewing on the current drive and directory. The symbols ..\ or \NAME refer to subdirectories on the disk. Selecting one of these entries will display the files in that directory.

The status bar at the bottom of the dialog box shows the filename or directory name highlighted. If a filename, you will see its filesize in bytes and the date and time it was created.

Usage Statistics

This option displays the amount of disk space which is used on each logical hard disk in a system. The report provided is similar to that of the DOS CHKDSK command with a few notable exceptions.

Bad Track Map

Selecting Bad Track Map will generate a listing of the bad tracks System Analyzer detects on the hard drive. A file is created in the root directory of the drive being tested that contains the list of bad tracks.

To generate a bad track list, select Bad Track Map from the menu.

Follow the instructions in the dialog boxes.

To display the file, from the DOS prompt enter:

TYPE d:\BADTRACK.00X

Where d is the drive you have tested and X is the drive number 0 or 1. To print the file, from the DOS prompt enter:

COPY d:\BADTRACK.00X PRN (or LPT1)

This list should be used to tell the low level formatting program which tracks are not able to reliably store data and should be avoided. This list is generated by testing each sector on the disk's surface, whether previously marked bad or not.

Memory

These menu options all relate to the system memory installed in your computer system. It provides information about the physical properties of the memory installed as well as the present contents of memory.

Overview

The basic system memory statistics are displayed. Submenus are available and can be selected in a similar manner as main menu options. The View Memory option requires user input.

Memory Managers

The right hand panel shows information about the memory managers which are active in the system. This information will vary from system to system.

BASE-DOS

The memory with addresses in the one megabyte Intel 8086 address space. In most systems this is limited to 640 kilobytes (655360 bytes).

EXPANDED-EMS

The memory which may be installed on specially equipped memory boards like the Intel "Above Board" and controlled through the use of an auxiliary memory manager which complies with the Expanded Memory Specification.

EXTENDED-OS/2

The memory which lies outside the 8086's one megabyte address space but within the 80286 and 80386 much larger virtual address space. This memory is of little use to either DOS or its programs but can be used for disk caching, virtual disks and emulating Expanded Memory. OS/2 uses this memory extensively.

EXTENDED-XMS

The Extended memory which is being managed by an auxiliary memory manager which complies with the Extended Memory Specification. An XMS driver is provided with System Analyzer.

TSR Map

This option reports the names, load addresses, memory consumption and interrupts trapped by the Terminate and Stay

Resident programs loaded into the system. The load address is specified as a four digit hexadecimal segment address. This is the significant part of the address where the program is loaded. The absolute load address is the displayed segment address with an offset of 0000. The length displayed is the size of the program's memory image in decimal.

Device Chain

This option reports the list of device drivers which are present in the system. Device drivers are the operating systems method of communicating with the hardware attached to the system.

For each entry in the device chain there are several pieces of information presented.

LOAD ADDRESS - The address in memory at which the device driver is loaded.

DEVICE NAME - The name of the device used by DOS. Note that the name of the file used to install the device in the CONFIG.SYS file and the DEVICE NAME are NOT necessarily the same.

INTR ADDRESS - The device driver's Interrupt Entry Point.

STRAT ADDRESS - The device driver's Strategy Entry Point. These two values are highly technical and convoluted. They are provided here for the convenience of users who need to know this information (generally Systems Programmers). If you are having extraordinary problems with a new hardware option, these values may be of interest to the manufacturers support engineer.

DEVICE ATTR - The Device Attribute Word. This is another technical statistic. This value defines to DOS the characteristics of the device which it controls.

EMS/XMS Verification

This option attempts to allocate all available EMS or XMS memory, write to that memory, read the written data, compare the data with the original and then deallocate the memory. The purpose of this test is to determine whether all the pages of EMS and XMS can reliably hold data.

A dialog box will open showing that the test is in progress. When completed, a window will open showing the results of the testing.

If an error occurs, a line will be printed in the window explaining exactly what was wrong and on which logical page the error occurred. This information will allow you to determine which particular memory device is defective by consulting the hardware manufacturers documentation.

View Memory

This option will display the current contents of any address in memory. Upon selection of this option you are prompted for a starting address. This address should be specified as a 4 digit hexadecimal segment address. Enter the memory location to view the contents of the memory. For example, to view a specific memory location, enter:

STARTING ADDRESS: B800

Once the starting address has been specified, System Analyzer will display the 256 bytes of memory which start with the specified address. Each line of the display shows 16 bytes of data in 2 digit hexadecimal form. Following the hex bytes on the same line are the equivalent ASCII characters for the bytes in the file. the ASCII characters on the right of the display may appear unusual. This is normal for non-ASCII (binary) information.

Video

This menu relates to the display adapter and display attached to the system.

Overview

If possible, System Analyzer will display the nature of the display attached to the display adapter currently active. Again, if a multimode adapter is present and it is currently in an emulation mode, the display being used may also appear to be different than expected.

VGA Details

If System Analyzer determines that a Video Graphics Array Adapter is present, you select PgDn to view detailed VGA information.

Current Video Mode

The current display mode. Since System Analyzer operates in the text mode, this value will be one of the standard text modes.

Current Scan Lines

The number of screen scan lines which are being used in the current mode.

Current Colors

The number of colors which are available in the current video mode.

Current Pages

The number of video pages which are available in the current video mode.

Video Memory

The amount of memory installed on the VGA. This value is expressed in kilobytes.

Maximum Scan Lines

The maximum number of scan lines which the VGA is able to display in text modes. Again, the higher this value is the sharper the text will be on the screen.

Video Modes Available

A list of all the video modes which are available with the adapter.

Adapters

Overview

This menu choice provides two standard levels of analysis of the contents of the expansion ROM area of the system's memory. Selecting this menu item will display a map of the memory range from address C000:0 through F000:0. The display will show the status of each of the four 16K "pages" of memory within each segment. The primary screen shows the I/O Card Area as a set of 4 16K pages within each of 4 64K segments. The offset address is shown for each block as well. The color of the block (or shading pattern in monochrome) indicates whether that area of memory is currently in use by an expansion card.

C000 - F000 Segment Detail

If a valid ROM is located within a specified segment, the copyright notice from that ROM will be displayed as well. This information is helpful in determining not only what address space is in use but what device is using it.

Hardware

This menu provides the I/O Card Area, I/O base port availability, an Interrupt vector table, a standard, or generic I/O port map, and Installation Assistant.

IRQ Availability

This window displays information about each of the 8 (16 in AT type systems) Interrupt Request channels available in a system. The information about each channel is displayed horizontally. The fields are:

IRQ

Each of the 8 (or 16) Interrupt request channels is assigned a number starting from 0. These numbers also refer to the relative priority assigned to the specific channel.

IMR Status

Each of the IRQ channels has a status bit in the 8259 Programmable Interrupt Controller. This is referred to as the Interrupt Mask Register (IMR). Only if the IMR Status is ENABLED does the 8259 interrupt the processor, all interrupts from DISABLED channels are handled in a special way and DO NOT TRANSFER CONTROL TO THE DEVICE SPECIFIC INTERRUPT HANDLING CODE.

ISR Name

The name (or category) of the Interrupt Service Routine (ISR) which will respond to the interrupt if the IMR Status for the channel is ENABLED.

Interrupt Vector Table

This option displays the segment and offset values (in hexadecimal format) for each of the 256 interrupt vectors supported by the Intel 86 family of microprocessors. These values are pointers (indirect references) to the address in memory where execution should be transferred upon invocation of the interrupt.

Installation Assistant

The Installation Assistant makes installing new hardware, such as network adapters and other specialized I/O boards much easier.

Selecting Installation assistant from the Main Menu will bring up the Installation Assistant screen. Note that the screen is divided

into SECTIONS, or columns. Pressing the Tab key moves the cursor from one section to another. Use the Up/Dn arrow keys to move from field to field within a section.

While you are in this screen, pressing Esc at any time returns you to the Main Menu.

IRQ Numbers | I/O Port Bases
Memory Address Ranges | DMA Channels

I/O Port Bases

To check I/O address availability, some user input is necessary. Type in a 4 digit hexadecimal address to check, then press Enter. If you press Enter on a blank field, '0000' will appear in that field. When you have finished entering I/O Port base addresses to check, press the Tab key to move to the next section.

Memory Address Ranges

To check for the availability of a upper memory address range, you must supply a starting and ending 4 digit hexadecimal address. As in the I/O Port Bases section, if you press Enter on a blank starting address field, '0000' will be displayed.
Type in a starting address and press Enter. The cursor will move to the ending address field and wait for you to supply a second 4 digit hexadecimal address. If you press Enter at this point, an address 4K bytes greater than the starting address will be supplied. Press the Tab key when you are finished entering memory address ranges to move to the next section.

TEST EXIT SAVE

Press Tab to move between these options. Pressing 'Enter' when **TEST** is highlighted will check availability on all I/O Port, memory address, IRQ and DMA channels.

SAVE

If it becomes necessary to check for the same I/O port or memory address ranges on a number of different systems, use the SAVE option to save the information you have entered on disk. The default file save name is **INSTALL.CFG**. You may rename this file after saving to make it possible for a number of different saved configurations to reside on the same disk. There can however, be

only one configuration file named INSTALL.CFG on the disk or parent directory where your System Sleuth files are stored. If INSTALL.CFG is found when Installation Assistant starts, you will be asked if the saved configuration should be used. If you answer Yes to this question, information stored in INSTALL.CFG is restored to the screen. If you answer No, Installation Assistant will start with empty address fields.

EXIT

Use the EXIT option to return to the Main Menu. Selecting this option performs the same function as pressing Esc.

I/O Port Map

A list is provided which represents a generic list of port assignments for systems of the type being examined. In other words, each type of system (PC,XT,AT,PS/2) has a different set of standard port assignments.

I/O port Usage

The I/O Port Usage option lets you query an I/O address before configuring and installing a new card, saving much guesswork. When I/O Port Usage is selected, you will be asked for a base I/O address. Most devices use I/O ports in groups of 8 at a time. Select PgUp/PgDn to examine port addresses before and after the address you originally specified.

Due to the fact that the low I/O address range contains 65,536 addresses, a very large number of possible device combinations can use this space. Some of these devices such as disk controllers and video adapters will interpret System Analyzer's I/O read signal as a command to perform some function. Extreme caution must be taken when using this option.

DO NOT QUERY I/O PORTS IN THIS AREA INDISCRIMINATELY

Reports

Report Options facilitate the preparation of formatted reports of System Analyzer findings.

Create Custom Header

Allows you to place a heading at the top of each printed report page. You may enter up to three lines of descriptive text. Note: You may remove the default page header from all reports by leaving the custom header lines blank and clicking or selecting Ok. Custom headers are only valid for the current report generation process. No report header information is saved except for the default header.

Select Report Items

Each available report item is indicated in the dialog box. Make your selections with the mouse, or press 'Tab' and move the pointer through the various options. Press the Spacebar to select AND unselect each report item.

Print Report

Select this option to send the selected report to the output device chosen in Printer Setup.

User Menu

This menu will display all of the user menu items input through the 'Setup Options / User Menu Setup' function on the System Menu. The menu items displayed are read from the file SLEUTH.MNU. If no file is present at startup, no User menu options will be available. Refer to the Getting Started section for more information on using User Menus.

System Test User's Manual

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About System Test

Welcome to System Test, an active diagnostics utility for IBM and compatible computers. System Test was developed to complement the passive reporting functions of System Sleuth. The System Test diagnostic extensions bring a new dimension to analyzing and resolving system conflicts and errors.

Getting Started

The first step in running System Test is to make a backup copy of the master distribution diskette. The master diskette is not copy protected and you may use COPY or DISKCOPY. Store your master diskettes in a cool, dry place, away from magnets, transformers and other sources of magnetism or excessive heat.

System Test can be run from floppy or hard disk, though it is strongly recommended that you use the floppy disk method. Unlike System Analyzer which relies on resident device drivers for its information, System Test operates more reliably when the system is booted 'clean' with no memory mangers, device drivers or Terminate and Stay Resident (TSR) programs installed.

The easiest method of running STEST from a floppy diskette is to format a bootable floppy in the drive that would boot your system. Refer to your DOS manual for more information on how to accomplish this.

After formatting is complete, copy all of the files from the original System Test distribution diskette to the newly formatted diskette and store the original in a safe place. DO NOT boot the machine with a DOS version of earlier release other than the version on the hard disk drive or damage to hard disk flle structure may result.

To avoid booting with the wrong DOS version, you may choose to remove all device drivers or TSRs from CONFIG.SYS and AUTOEXEC.BAT on the hard disk, then reboot the system. In this case, formatting a bootable floppy diskette is not necessary and System Test may be run directly from the hard disk. Make sure the diskette with the System Test files is in the drive and type:

A>STEST and press Enter

Screen Layout

After System Test loads, the desktop will appear. The menu bar displays the following options:

File Diagnostics Configuration Benchmarks Help

Press and hold down the Alt key and press the highlighted letter in the menu title you wish to use. A menu will drop down revealing options available.

Selecting any of the menu items will may open another sub-menu displaying additional options. Press the Esc (escape) key at any time to return to the previous menu. A description of the menu options and the results (or error code) of any test will appear in a dialog box on the desktop.

The status bar at the bottom of the screen shows the keyboard commands available with any given menu option.

Configuration

While not the first menu item, the configuration menu allows you to set the operating characteristics of System Test.

Batch Mode (On/Off)

This menu option toggles batch operations on and off. Batch mode allows you to select a number of diagnostic tests and run them repeatedly. This option is useful for intermittent problems that do not appear in a single run of a test, or for 'burning in' a new system after assembly. Turn batch mode on or off by selecting the option. When batch mode is on, moving to the Diagnostic menu and selecting any test will place a check mark next to the option, enabling that option to run ion batch mode.

Auto Log (On/Off)

Selecting Auto Log provides a means of specifying how the test results report generated by System Test will appear. Auto Log options are:

Printer

Sends diagnostics report to the current printer.

File

Sends the report to a disk file with the default filename STESTLOG.LOG. Press Enter to accept the default filename or type in a new filename and press Enter.

Individual Tests

Outputs the results of a single test or if the tests are performed a number of times, the overall results of testing.

Repetitive Summaries

Selecting this option generates a report entry on every pass of a test.

Both

This option sends creates both a summary and a individual test report.

Memory Layout

This option gives you the ability to provide System Test with details about your System memory setup. Due to the large differences in system memory design, no one memory layout will work with all machines.

Display Memory Layout

Shows the currently described memory layout or the layout defined in the configuration file read from disk.

Describe Memory Layout

Supplies a method of describing the layout of system memory. The amount of conventional (DOS) and Extended memory is shown. Press any key to begin the process of describing the memory layout on the system. Use the <- -> left/right arrow keys to select the proper memory device size to each bank. When all banks have been defined, use the arrow keys to select Done.

Run Batch

Activates the batch test process if any tests have been selected after Batch Mode is turned On.

The testing procedures available on an individual basis may be selected to run continuously to locate an intermittent component failure. Selecting Interactive pauses the process between tests. Enter the number of times you wish the tests run.

File Menu

The File menu allows saving and retrieving configuration files for systems under test as well as establishing password protection for diagnostic functions.

New

Sets up a new configuration file describing the system under test. You may supply the date, user name and equipment identification information.

Open

Opens and reads a previously created configuration file into memory.

Save

User/equipment, benchmark testing and memory configuration results are saved under the default filename STEST000.CFG.

Save As

Allows a different save filename to be entered and used other than the default filename. Multiple configuration files can be saved on the same disk or subdirectory.

Settings

This option allows the setting of a security password to disable or enable diagnostic testing.

Change Password

Enter the current password (the default password is DFISTEST).

Keep a record of the any password changes: if diagnostic testing is disabled, enabling requires the correct password. Once the password is changed, the default password will no longer function.

Disable Tests

This option makes it impossible to run any hardware tests without first supplying the correct password. This helps to avoid accidental erasure of data or system lockups due to user inexperience.

Diagnostics

System Test provides a wide range of diagnostics that examine major components of the system or motherboard. Testing concentrates on the major IC components of the system board and are selected on an individual basis.

System Board Tests

CPU Test

This option tests the CPU and its ability to communicate with the system. Special testing is performed on the 80286 and 80386 CPU as well as common CPU functions.

Protect Mode

80286 and 80386 CPU protected stack operations. Checks the ability of the CPU to address extended memory. The privilege level if the CPU is also tested. Privilege level relates to CPU ability to switch from real mode into protected mode and back again.

CPU Speed

The speed of the CPU is gauged executing a series of instructions and counting the number of clock cycles (ticks) it takes to perform the operation. Test results are shown in Dhrystones.

Math Coprocessor

(8087, 80287,80387)

The Numeric Processor Extension (NPX) is reset and prepared to accept instructions. The NPX transfers data at such a high rate of speed, errors sometimes occur. Some AT class systems are especially prone to this problem. The test checks NPX transfer rates during disk access.

DMA

The 8237 DMA Controller is tested for addressability. The counter and page registers. 80286 and 80386 systems have two DMA Controllers. On these machines, both chips are tested.

Interrupt Controller

System Test checks the internal registers of the interrupt controller(s).

Real Time Clock (RTC)

On systems with a real time clock circuit, a check is performed to verify clock accuracy.

CMOS RAM

System test examines the CMOS registers. A checksum is performed on the RAM area. If the CMOS setup reports more than 1 megabyte of memory installed, extended memory addressing is verified.

Refresh Controller

System Test checks out the refresh circuit and all timing circuits involved with the refresh process.

Memory Tests

This main menu selection offers a variety of choices for memory testing. Read-only and dynamic RAM is tested through these facilities.

BIOS Checksum

Checks for a readable ROM memory device in C0000 to F0000 and verifies its validity.

Parity

Parity is a method of checking the correctness of data stored in RAM. Data values are written and read back from memory locations. An interrupt condition (NMI) is monitored during the write/read test to detect a parity problem.

Pattern Write/Read

Dynamic RAM failures are frequently intermittent in nature. Hardware failures could include overheating conditions due to environment, chip legs bent or broken during installation, electrical noise due to bad AC line conditions, or a faulty system power supply. A memory cell in a dynamic RAM chip represents a bit of information. Eight RAM chips form an entire byte of data. If only one bit cell fails, the byte is corrupted. Pattern testing can force a RAM chip to fail. This is due to the fact that certain data patterns are inherently more difficult to store than others.

Walking 1's and Walking 0's Test

Another method of locating faulty memory is to use a 'walking' pattern test. System Test uses two - walking 1's and walking 0's. In both tests, a bit value (0 or 1) is placed into the one end of a

byte and repeatedly moved across the byte until it reaches the other end.
The selected data bit 'walks' across the byte, one position at a time.

Sequential Address Test

Memory addressability is tested similar to a write/read/verify test. The memory addressability test is less thorough, however.

Hard Disk Tests

Hard disk drives on the system can be scanned for surface defects, tested for the proper disk interleave, low-level format the disk and gather performance statistics on the drive.

ESDI and SCSI hard disks have embedded formatters which make the System Test procedures unnecessary. As a result, ESDI and SCSI hard disk diagnostics are not currently implemented on this release of System Test. Many manufacturers of IDE hard drives recommend against the user performing a physical format of the unit. Check the documentation of the hard disk before running any destructive hard disk test or procedure.

Data Transfer Rate

This test checks the overall data transfer rate of the disk as well as the overall seek time of the read/write heads. Performance statistics are shown in kilobytes of data transferred per second.

Seek Operation

The ability of the head positioning circuit to accurately move the read/write heads over a given cylinder is called its seek ability. System Test performs a seek test by asking for a specified minimum and maximum cylinder range. Cylinders within that range are selected at random and the heads moved over the cylinder. If data cannot be correctly read, an error is recorded.

Destructive Write/Read

The hard disk under test is checked for surface defects. A repetitive set of 'worst case' data patterns written to the disk are read back and verified.

All data on the disk will be destroyed during this test.

Non-Destructive Wr/Rd

Cylinders and sectors are selected, data read and stored safely in memory. A worst-case data pattern is then written to the sector. The data is read back and compared in the same manner as the destructive write/read test. Finally, the data originally read is written back to the sector, completing the test. Verify errors are recorded.

Drive Type

AT class systems identify hard disk drives as a drive type. System Test examines and displays the CMOS RAM data on any installed hard disks.

Bad Track Editor

Every hard disk drive fresh from the factory may have defective areas. These areas are detected by analog testing machines of great sensitivity. The defective areas are recorded on a label attached to the disk drive. The drive controller skips over a bad sector or track during formatting and the area is not used to store data.

All data on the disk will be destroyed during formatting.

Physical Format

The hard disk drive can be low-level or physically formatted using this option. Electrical and mechanical component drift can cause a hard disk drive to experience read or write errors. When this occurs, the only method of adjusting the drive is a low-level format. The format procedure used by System Test is a destructive format. Back up all data if possible before formatting.

All data on the disk will be destroyed.

Partition Editor

This option allows for the display, creation or modification of the hard disk partition table data, defining the drive and its logical segmentation.

Optimum Interleave

The ability of a disk drive to read and write data quickly depends upon the drive model, disk drive controller used and the machine acting as host. Sometimes data cannot be transferred from adjacent sectors due to system/drive timing incompatibilities. To make allowances for these timing problems, data is not stored in sectors one after another. The disk controller skips over one or more sectors to give the system time to process data completely. The number of sectors skipped over is called the interleave factor. Interleave factors will change if a disk and controller is moved to a machine of different performance capabilities. System Test will examine data transfer rates on the drive and select the optimal interleave factor. This interleave factor is introduced to the drive during low-level formatting.

All data on the disk may be destroyed during this test.

Floppy Disk Tests

Before testing, a floppy disk drive is checked for type. The types available for testing include:

5.25 inch, 360 KB | 5.25 inch, 1.2 MB
3.5 inch, 720 KB | 3.5 inch, 1.44 MB

Controller

Internal condition of the floppy disk controller is tested by writing, reading and verifying data into the status, data and control ports of the chip.

Change Line

A formatted diskette is inserted into the drive and the door closed. The diskette is then removed and reinstalled in the drive to test disk change detection.

Write Protect

Use this option to verify operation of the write protect sensor. Select a floppy disk unit to test and insert a write-protected floppy diskette into the drive.

RPM

To perform the drive speed test it is necessary to insert a formatted diskette in the drive. System Test will advise that you allow the RPM test to continue for 3 minutes to ensure detection of drive

abnormalities. Minimum and maximum speeds are displayed and an error is reported if drive rotation exceeds acceptable tolerances.

Cleaning Routine

This option may be used in conjunction with a cleaning diskette to clean the read/write heads of the floppy disk drive. Prepare the cleaning diskette according to manufacturer's suggestions and insert into the selected drive. You will be asked to supply the maximum number of tracks the drive can read and write and the number of passes the heads should move across the disk surface. When activated, the drive will rotate the cleaning diskette and move the read/write heads between track 0 and the maximum track number the requested number of times. This ensures that no one track is used repeatedly on the cleaning diskette, leading to dirt transfer to the heads from the diskette during the session.

Head/Track Adjustment

Use this option with a floppy disk radial alignment diskette to position the read/write heads over the correct track for azimuth and radial alignment adjustments. The heads will seek the requested track and the drive will rotate until a key is pressed to cancel the operation.

Format Diskette

This test will format a floppy diskette in the selected drive at the track interval of the user's choice. Use a blank, or non-vital floppy diskette for this procedure, as all data on the diskette will be destroyed.

Keyboard Tests

Proper function of the keyboard is not just a matter of locating a defective key switch. System Test performs a number of tests on the keyboard and related hardware to detect any possible faults.

Controller

The 8048/8049 keyboard controllers on XT/AT class and the 8042 controller on AT and 80386 class keyboards are tested. The controller is reset and all status ports are checked for their ability to store data. On AT systems, 8042 keyboard controller ability to enable the A20 address line is tested. If the 8042 cannot enable the A20 line, the system will be unable to properly access memory above one megabyte (Extended memory).

Scode Codes

This test allows each key to be tested in turn for correct operation. The scan code (a numeric value representing a key physical position on the keyboard) and ASCII value assigned to that key is shown to assist in detecting incorrect scan codes.

Cancel this operation by pressing the Esc key twice, but not in succession.

Protect Mode

Checks the ability of the keyboard controllers on AT class systems to shift the processor into protected mode. The keyboard controller regulates use of the A20 address line by the CPU on AT class machines. Without access to the address space made available by A20, the CPU would not be able to shift into protected mode operation.

Video Tests

Each video display adapter is capable of different video characteristics. The menu options under video testing will vary according to the adapter under test.

Color Palette

System Test checks the ability of the adapter to display correct colos in foreground, background and border areas of the screen.

Text Modes

A text attribute is the way that a character appears on the video display. Attributes include color, blinking, reverse video and intensified text. All text attribute modes available to the adapter are tested.

Character-Font Test

Video adapters such as the Video Graphics Array (VGA) support a number of screen fonts for use in a number of graphics and text-based display modes. System Test attempts to access and display all available display fonts.

Pages

In text and some graphics modes video RAM is divided into separate areas, or pages. A video page is a memory area large enough to fill an entire screen with graphics or characters. The system can write to one video page while displaying another. The

amount of video RAM on the adapter determines the number of video pages available. Page selection is tested in numerical order. Pressing any key shifts the test to the next available page.

Convergence and Alignment

During service and adjustment of a video display, this option provides a grid of horizontal and vertical bars for correcting screen position and appearance of the display.

Graphics Modes

Nearly Every video adapter has the ability to display text, graphics, or a combination of both text and graphics on the video display screen. STEST detects the type of video display technology in use on the system and performs a series of test cycles on the adapter. Each method of displaying video information is called a *video mode*. In graphics modes of operation, STEST checks the operation of the video controller chip and the video RAM installed on the adapter by writing data to video memory, then reading the data back to verify video RAM operation.

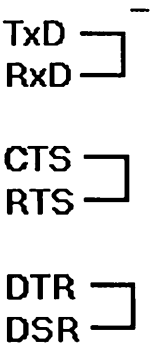
I/O Port Testing

Serial and parallel port tests are provided for systems with such options installed. The Serial port tests can be performed with or without a 'loopback plug'. Loopback testing sends output lines to complementary input lines to ensure proper adapter operation. In both the serial and parallel ports tests, it is necessary to select the port to test before any tests may be selected or performed. Use the Select Port option and use the left/right arrow keys to select a port for testing.

The wiring configuration of a nine pin and 25 pin loopback plug is provided for the DB9 and DB25 D-shell connectors.

Table 1

DB9	DB25	Signal Name
2	2	Transmit Data (TxD)
3	3	Receive Data (RxD)
7	4	Request To Send (RTS)
8	5	Clear To Send (CTS)
6	6	Data Set Ready (DSR)
4	20	Data Terminal Ready (DTR)



Serial Internal Loopback Test

These tests may be performed without an external connector installed. Internal testing of the Universal Asynchronous Receiver-Transmitter (UART) is performed at baud rates from 300 to 19,200 baud.

Serial External Loopback Test

This test MUST be performed using the loopback plug illustrated in Figure 1. Connect the plug to the serial adapter under test and start by hitting Enter. The receive and transit data, request to send and clear to send lines are tested for correct input/output, or handshaking status. Data transfer is checked at 9600 baud.

Parallel Adapter Test

The parallel adapter consists of the Status, Data and control latches. Each is tested in turn by writing to and reading from the latches.

Print Test Pattern

Selecting this option allows the printing of a test chart used to verify printer status and resolution. Use the arrow keys to select a standard ASCII, Postscript or HP Laser style test pattern.

Pointer Device

If a mouse and its memory resident device driver is installed, the mouse may be tested. Tests are performed on mouse movement and button operation. The test will show relative horizontal and vertical position of the mouse pointer and provides the means of testing operation of the mouse buttons.

Benchmarks

Benchmarking is a method of evaluating the overall computing speed of a system. It is not enough to know the clock speed of the microprocessor, though, generally speaking, a faster clock speed will result in faster computing speeds.

The overall performance of a system is based upon how fast data can be processed by the CPU, displayed on the video screen and transferred to and from a hard disk drive.

CPU Speed

System Test Calculates microprocessor using Dhrystone tests. The Dhrystone testing process performs a series of tests, or loops, of specific instructions in an attempt to simulate typical program operation. The quicker the system processes these instructions, the more efficient it is.

Video

Video testing is performed in a similar fashion to CPU testing. The video adapter is called upon to generate a number of fixed graphical shapes and the elapsed time to perform these tasks gauges the overall video display speed of the system.

Disk I/O

A fixed-size file is written to the disk and then read back. The amount of time taken determines overall disk transfer speed. The results of all benchmark tests can be saved to disk for later comparison against other systems. For comparison, a set of baseline system performance results have been provided.

Technical Support

Like any product which relies on the consistency of the hardware and software interface to function properly, System Sleuth Professional is not a static product. As the platforms on which it runs change, System Sleuth Professional will also change.

In addition, the product which you are looking at now is a collection of tools which were deemed important from our experience and the input of our advisors. Only you can tell us what you like or dislike about System Sleuth Professional. It is our desire to make System Sleuth Professional a tool which is useful to you.

In this light, we are extremely interested in hearing your thoughts about the product. We are committed to incorporating those enhancements and additions which you request and seem reasonable and consistent with the product concept.

With your help System Sleuth Professional can be exactly the product you would like it to be.
Please let us hear from you.

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